

MONITORING OF THE TROPOSPHERE AND IONOSPHERE BY USING FORMOSAT-3/COSMIC

*J. Y. (Tiger) Liu ^{*a} and G. S. Chang ^b*

^a *National Central University, Chung-Li TAIWAN, and National Space Organization, Hsinchu TAIWAN; tiger@nspo.narl.org.tw*

^b *National Space Organization, Hsinchu, Taiwan; +886-3-5784208Tel; gschang@nspo.org.tw*

KEY WORDS: FORMOSAT-3/COSMIC, radio occultation, troposphere, El Niño, ionosphere, electron density profile

ABSTRACT: The FORMOSAT-3/COSMIC (F3/C) constellation launched on 15 April 2006, which consists of six micro-satellites in the low-Earth orbit, is capable of monitoring the troposphere and ionosphere by using the powerful technique of radio occultation. With more than 2500 observations per day, it provides an excellent opportunity to monitor three-dimensional structures and dynamics of the troposphere and ionosphere. Vertical profiles of the temperature and pressure in the troposphere as well as those of the electron density in the ionosphere are derived from the GPS occultation experiment (GOX) onboard F3/C. Pronounced signatures of El Niño and La Niña associated with the Walker Circulation, reversed the Hadley Circulation along the Tibetan Plateau-Indian Ocean longitude, and planetary wave signatures in the Polar Regions are presented. On the other hand, this is the first time that a satellite constellation provides instantaneously the ionospheric electron density up to the satellite 800 km altitude. The ionospheric vertical electron density profiles inverted from occultation TEC (total electron content) measurements every day, ionospheric plasma structures over many continents and most of oceans, where ground-based observation is limited, are now observed continuously. Important ionospheric research topics, such as space weather effects to the ionosphere, variations of ionospheric plasma structure and dynamics produced by solar outputs can be widely studied and modeled based on the three-dimensional ionospheric images constructed by the F3/C observations. After five years in orbit, a great amount of radio occultation soundings allow us to construct global ionospheric maps to study the ionospheric seasonal effects. Taking advantage of the uniqueness of dense global coverage, the two large scale structures of the equatorial ionization anomaly and the mid-latitude trough in the ionosphere are given.